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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/373,544	08/13/1999	HIROSHI NAKATSU	829-522	2693

7590 12/30/2002

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EXAMINER

KANG, DONGHEE

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 12/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/373,544

Applicant(s)

NAKATSU ET AL.

Examiner

Donghee Kang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 October 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-4 and 11-16 is/are rejected.
- 7) ☒ Claim(s) 2 and 5-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Acknowledgment

1. Applicant's Response to Paper No.11 has been entered and made of Record (Paper No.12).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims **11 & 15** are rejected under 35 U.S.C. 102(b) as being anticipated by Fletcher et al. (US 5,008,718).

Fletcher et al. disclose a light-emitting diode, comprising (Fig.2):

a semiconductor substrate (20); and a layered structure comprising an AlGaInP compound semiconductor material provided on the semiconductor substrate, the layer structure comprising:

a light emitting structure comprising of a pair of cladding layers (21 & 23) and an active layer (22) for emitting light provided between the pair of cladding layers (21 & 23) and a current diffusion layer (24) comprising an AlGaInP type compound semiconductor material (**Col.3, lines 31-34**). See also Col.3, lines 6-56.

Fletcher et al. do not teach the AlGaInP diffusion layer being lattice-mismatched with the AlGaInP light-emitting structure. The AlGaInP diffusion layer of Fletcher et al. has a low resistivity than the AlGaInP light-emitting structure to provide a good

conductivity. Note that the low resistivity is obtained by changing a composition of Al and/or In in AlGaInP compound layer. So the AlGaInP diffusion layer of Fletcher et al. would have a different composition of Al and/or In compared with the AlGaInP light-emitting structure because it has a lower resistivity than the AlGaInP light emitting structure. Thus, the AlGaInP diffusion layer of Fletcher is lattice-mismatched with the light-emitting structure since it has a different composition of Al and/or In.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims **1, 3, 12-13 & 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. (US 5,008,718).

Fletcher et al. disclose a light-emitting diode, comprising (Fig.2):

a semiconductor substrate (20); and a layered structure comprising an AlGaInP type compound semiconductor material provided on the semiconductor substrate, the layer structure comprising:

a light emitting structure comprising of a pair of cladding layers (21 & 23) and an active layer (22) for emitting light provided between the pair of cladding layers (21 & 23) and a diffusion layer (24) comprising an AlGaInP type compound semiconductor material (**Col.3, lines 31-34**), wherein the diffusion layer is transparent (Col.3, lines 39-42), *See also Col.3, lines 6-56.*

Fletcher et al. teach the AlGaInP diffusion current layer being a lattice-mismatch with the light-emitting structure but do not teach that the lattice mismatch of the diffusion current layer with respect to the light emitting structure is -1% or smaller. Note that the conductivity of AlGaInP compound layer can be changed with varying a composition of Al and/or In. Fletcher et al. teach that the AlGaInP may be used for a current diffusion layer by increasing the conductivity. This gives a lattice-mismatch between the current diffusion layer and light-emitting layer because of a different composition of Al and/or In. The lattice-mismatch causes a high dislocation density and the dislocation degrades the optical properties of the device. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize lattice mismatch of the current diffusion layer with respect to the light-emitting structure in order to prohibit a high dislocation density which degrades an optical properties.

6. Claims **4 & 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fletcher et al. in view of Hosoba (US 5,814,839).

Regarding claim **4**, Fletcher et al. do not explicitly teach a composition of the current diffusion layer being expressed as $(\text{Al}_x\text{Ga}_{1-x})_{1-y}\text{In}_y\text{P}$, wherein x is set in the range of 0.01 to 0.05 and y is set in the range of 0.01 to 0.3 in the composition. However, Hosoba teaches the current diffusion layer expressed as $(\text{Al}_x\text{Ga}_{1-x})_{1-y}\text{In}_y\text{P}$, and x is set in the range of 0 to 1 and y is set in the range of 0 to 1 in the composition, which are in the claimed range. It is conventional in the art that the composition of Al and In can be

changed to obtain a desired resistivity. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a composition of Al and/or In in the AlGaInP diffusion layer in order to obtain the desired resistivity or conductivity.

Regarding claim 14, Fletcher et al. teach substantially the entire claimed structure, as applied to claims 1 & 11 explained above, except that the semiconductor substrate is in a [011] direction with respect to a (100) plane thereof. However, Hosoba teaches the semiconductor substrate inclined in a [100] direction with respect to a (100) plane thereof. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a LEDs of Fletcher on the substrate inclined in a [011] direction with respect to a (100) plane thereof as taught by Hosoba since when a AlGaInP compound semiconductor material is grown on the surface of the substrate inclined in a [011] direction with respect to a (100) plane thereof, a super-lattice is not formed and light can be prevented from having a longer wavelength due to the super-lattice.

Allowable Subject Matter

7. Claims 2 & 5-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. Applicant's arguments filed 11 October 2002 have been fully considered but they are not persuasive.

Applicant argues that Fletcher et al. does not teach using AlGaInP as a current diffusion layer. The examiner disagrees with this remark. Fletcher et al. clearly teach that the AlGaInP alloy system comprises an essentially continuously ranges of suitable alloys for making LEDs. The material for the window layer (current diffusion layer) may actually include all four of these elements. **See Col.3, lines 31-34.**

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

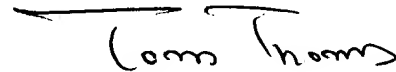
10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

A handwritten signature in cursive script that reads "Tom Thomas".

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

dhk
December 18, 2002